National Aeronautics and Space Administration

May 26, 2000

NRA-00-OES-05

RESEARCH ANNOUNCEMENT

Oceanography

Proposals Due July 26, 2000

OMB Approval No. 2700-0087

Oceanography

NASA Research Announcement
Soliciting Research Proposals for
Period Ending
July 26, 2000

NRA 00-OES-05
Issued May 26, 2000

Office of Earth Sciences
National Aeronautics and Space Administration
Washington, DC 20546

NASA RESEARCH ANNOUNCEMENT

Soliciting Investigations Contributing to

Oceanography

1.0 PURPOSE OF THIS NASA RESEARCH ANNOUNCEMENT

The purpose of this NASA Research Announcement (NRA) is to solicit proposals for scientific investigations and activities contributing to the continuation and enhancement of NASA's Physical, Biological and Polar Oceanography Programs.

This NRA solicits investigations in the areas of physical and biological oceanography, and in the area of polar oceans and sea ice. The present announcement is for the selection of investigations to be carried out for a period of 3 years.

2.0 BACKGROUND

2.1 NASA's Earth Science Enterprise

NASA's Earth Science Enterprise (ESE) seeks to develop an understanding of the total Earth system and the effects of natural and human-induced changes on the global environment. The ESE has prepared a Science Implementation Plan, the full text of which will be available from the NASA Earth Science Enterprise web site. The key research topics studied by the ESE, and outlined in the SIP, fall largely into three categories: forcings, responses, and the processes that link the two and provide feedback mechanisms. This conceptual approach applies to all research areas of NASA's Earth science program, although it is particularly relevant to the problem of climate change, a major Earth science-related issue facing the world. The SIP also lists research questions under each theme of Earth science, and the ones that apply to this NRA are listed in the next Section.

The overall approach for the ESE is to acquire a multi-decadal, multi-sensor, global, data set, backed up by other remote sensing and *in-situ* measurements, process studies, and models. These observations are being and will continue to be provided by NASA and by other international space agencies within the near term (1-5 years), and plans are being developed to transition these observations to operational agencies in 5-10 years. NASA will continue to develop space-based exploratory and technology-demonstration missions in response to scientific needs and priorities (NASA, 2000).

2.2 The Oceanography Program

The Oceanography and Polar Programs at ESE contribute in particular to two of the five major themes of the ESE Science Implementation Plan (NASA, 2000), namely the Biology and Biogeochemistry of Ecosystems and the Global Carbon Cycle, and Climate

Variability. Specific science questions as they relate to physical, biological and polar oceanography are listed in the SIP (see Section 2.1) concerning the natural and human-induced variability in the ocean, and the responses of the ocean to that variability. These questions, from the SIP, are:

(1) How is the global ocean circulation varying on climatic time scales?
(2) How are global ecosystems changing?
(3) Are polar ice sheets losing mass as a result of climate change, and will changes in polar ice sheets cause a major change in global sea level?
(4) How do ecosystems respond to environmental change and affect the global carbon cycle?
(5) To what extent can long-term climatic trends be assessed or predicted?

This NRA will address oceanographic and sea ice research activities that relate to one or more of the above five questions. To this end, the ESE Science Implementation Plan calls for global observations of the ocean, in terms of color, altimetry, surface winds, surface temperature, and sea-ice, and for the development of models that enable these observations to be interpreted. The programs place emphasis on the productive cross-fertilization of activities related to observations, modeling, and field campaigns. The NASA Oceanography Program also participates in the National Oceanographic Partnership Program (NOPP) which solicits proposals approximately once per year through a Broad Agency Announcement. NASA has focused much of its support for activities related to the Global Ocean Data Assimilation Experiment (GODAE) through the NOPP and expects to continue this approach.

The primary scientific thrust for **physical oceanography** at NASA is toward understanding the ocean's role in climate variability and its prediction. Since the general ocean circulation plays a critical role in the global heat balance and materially changes atmospheric properties through air-sea exchange, fundamental understanding and modeling the state of the coupled ocean-atmosphere system is fundamental to climate studies. NASA utilizes the unique vantage point of space to enable rapid collection of global ocean data sets such as sea-surface temperature (EOS Terra, the Tropical Rainfall Measuring Mission, TRMM), sea-surface topography (TOPEX/Poseidon), sea-surface vector winds (QuikSCAT). NASA also` intends to contribute significantly to the World Climate Research Program's Climate Variability and Predictability (CLIVAR) Program.

Simulations of **sea ice** dynamics suggest that some of the most marked responses to climate change would be expected to occur in the high latitudes, and in particular in the Arctic. Sea ice modulates planetary heat transport by insulating the ocean from the cold polar atmosphere, and also by modulating the thermohaline circulation of the world ocean through the process of brine rejection. Moreover, the high albedo of snow-covered ice further insulates the polar oceans from solar radiation and introduces another positive feedback in the climate system. Simulations of future climate are therefore very sensitive to the ways in which the high latitudes are represented in models of the climate system. By supporting the development and analysis of extensive and novel observations of the

polar regions acquired by current space-based systems such as RMSP, Radarsat, QuikSCAT and future missions such as EOS Aqua and ICESat, to be operational in the 2001 timeframe. NASA has an important role to play in helping to refine the way in which high latitude climate and the polar oceans and sea ice in particular are simulated.

These same observations and analysis methods can also be used to establish the nature and significance of current change in the high latitudes. Time series of sea-ice concentration data are critical for identifying interannual and decadal fluctuations that could point to the existence of significant changes in oceanic and atmospheric circulation at high latitude. Changes in the large-scale circulation of the ice pack may provide insight in the response of the high latitude environment to, and in turn influence on, changes in ocean and atmosphere circulation at lower latitudes. Other efforts are being directed towards obtaining additional information about the polar regions, for example through early demonstrations of data assimilation and by the development of novel techniques such as Lagrangian ice tracking for the mapping of areas of thin ice. In recent years much attention has been focused on describing teleconnections between elements of the climate system at high latitudes, which has been made possible through the advent of wide-coverage observations of a variety of geophysical parameters that now extend back, in many cases, for 2 or more decades.

The emphasis for research in **biological oceanography** will be the role of the ocean in the carbon cycle. One of the unknowns is the magnitude and variability of the so-called 'biological pump', that is, how much carbon is exported from the surface to the deep ocean. NASA's contribution to this effort is to understand the variability in primary producers, the phytoplankton, through satellite observations of ocean color. Much of the spatial and temporal variability of phytoplankton in the ocean is caused by blooms, and the blooms are usually characterized by particular species of phytoplankton. Thus, by both determining the nature of the variability in ocean color, and by being able to determine the species responsible, significant progress will be made in understanding the ocean's role in the global carbon cycle. The Sea Wide-Field-of-View Sensor (SeaWiFS), together with the Moderate Resolution Imaging Spectroradiometer (MODIS) (on EOS Terra and Aqua satellites), will be able to view the phytoplankton content of the ocean on unprecedented time and space scales. MODIS in particular, has the potential to aid in the identification of taxonomic groups of phytoplankton from space, and to be able to discriminate phytoplankton from other optical components in coastal waters by observing fluorescence emission.

No complete understanding biological variability in the ocean will be forthcoming without complementary knowledge of the physical processes acting upon it. Thus, images of ocean color, which portray biological variability are driven by physical processes, such as surface winds and circulation. A variety of sensor types, therefore, can be applied to solving problems in biological oceanography. At the same time, it is recognized that there are regions of the ocean (e.g., the tropics, near coastlines) where one or more satellite sensors will have difficulty in making accurate observations. The conclusion is that multiple sensors can be employed advantageously to aid in understanding oceanographic

processes. Or, there may be novel ways to extend the use of altimetric, temperature, or wind sensors to provide insight into productivity or biological phenomena.

An emerging area of increased emphasis in NASA's Oceanography Program is research on the coastal ocean. While NASA's focus will remain global in nature, it is recognized that the practical problems of humanity's interaction with the ocean lie within the coastal seas.

Finally, there are clear indicators that phytoplankton can influence the chemistry of the lower atmosphere and the stratosphere, and may have an effect on the local climate through emission of aerosol precursors. The relationships among solar forcing, UV radiation, weather, phytoplankton growth, and the dynamics of the ocean's surface layer are likely to be exceedingly complex, requiring multiple data sources.

Depending on the proposed work, investigators may be invited to become members of mission Science Teams, supporting current (SeaWiFS, Ocean Vector Winds) or future missions.

3.0 RESEARCH TOPICS FOR REQUESTED PROPOSALS

This NASA Research Announcement solicits proposals that address the following topics. Proposals may include elements associated with more than one topic, but must clearly delineate the work and budget for each topic. Each topic is described in greater detail in the following section.

(1) Analysis and interpretation of ocean processes using satellite, aircraft, and in situ data.

With NSF, the program shares funding proposals submitted for synthesis of results from the World Ocean Circulation Experiment (WOCE). In addition to WOCE synthesis, the present announcement seeks modest proposals undertaking analysis of satellite altimetry, surface wind stress, and other relevant data in support of the CLIVAR Program. Theoretical developments in the area of longer time-scale coupled atmosphere-ocean modes of variability are also sought to catalyze future data analyses. Under this topic as well, are analyses and models which couple physical an biological processes in the ocean, at regional to global scales, and which can incorporate the behavior of different plankton trophic levels and taxonomic groups.

(2) Multi-sensor approach to understanding ocean phenomena.

One obvious example is that color, altimetry (sea surface height) and temperature indicate upwelling areas. An emerging area of research in remote sensing that NASA will exploit is the use of ocean color variability to indicate physical phenomena (circulation, upwelling), and, vice-versa, the use of dynamic topography and winds (for example) to estimate productivity.

(3) Understanding and estimation of air-sea fluxes

The ability to make global estimates of air-sea fluxes of heat, freshwater, momentum, and gases is fundamental to our capability to predict long-term climate variations. Development of methodologies to utilize remotely-sensed properties of the sea surface to determine fluxes are sought. Phytoplankton growth in the ocean is responsible for concentrations of gases such as methyl bromide and dimethyl sulfide, which in turn have a significant influence on the chemistry of the upper and lower atmosphere, respectively, and which ultimately may play a role in climate. Research in this area is expected to provide a basis for using satellite-derived phytoplankton and physical data to estimate natural background sources of these gases and their fluxes across the sea-surface. Research is also solicited to establish the role of sea-ice in modulating key fluxes between the ocean and the atmosphere and in particular in controlling thermohaline circulation.

(4) Providing the scientific basis for next generation ocean remote sensing technologies.

Priority areas presently supported include GPS reflections phenomenology, surface salinity remote sensing and sea-ice thickness measurement (including snow cover), and optical sounding of the ocean with lasers. Program support is confined primarily to theoretical development of physics and signal processing. Instrument development is the subject of separate program announcements from NASA Headquarters.

(5) Temporal and spatial variability of primary productivity and new production in ocean

A key to understanding the 'biological pump' in the ocean is to learn about the variability of primary productivity. Seasonal or episodic blooms cause most of the variability, and thus knowledge of this variability will be needed to improve the accuracy of the productivity estimates of the global ocean. Under this topic the development of algorithms for the calculation of productivity from ocean color and other data will also be considered.

(6) Identification of phytoplankton taxonomic groups from space or airborne sensors

Recent research indicates that carbon cycling within the euphotic layer depends upon plankton community structure, and that phytoplankton blooms may be the most significant phenomenon contributing to the export of carbon to the deep sea. Following the topic immediately above, a key to understanding carbon cycling in the ocean is to understand what controls blooms, for example diatom blooms. Aside from diatoms, other functional phytoplankton groups also play specific roles, such as the production of calcium carbonate or the fixation of nitrogen. Characterizing the distribution of these key phytoplankton groups is a central scientific goal.

(7) Investigating and evaluating oceanographic links between high latitude climate and lower latitude climate.

Simulations suggest that the high latitudes (particularly the high, northern latitudes) will be most sensitive to any greenhouse gas – induced warming. Studies that can shed light on the extent to which climate at high latitudes is effectively and responsively linked to climate at lower latitudes through any oceanographic or sea ice response are important. Such studies will help to determine the amplitude and rapidity of the response of the climate system as a whole to any greenhouse gas – induced warming. Key elements of interaction include freshwater import (from rivers) and export, ice mass re-distribution, thermohaline circulation and atmospheric dynamics particularly in the marginal ice zone. The key is to be able to devise a strategy that enables the importance of these linkages to be evaluated and this is likely to require close coupling of modeling and observational analysis.

(8) Development and demonstration of data assimilation techniques for the improvement of polar ocean and sea ice models.

Data assimilation offers a possible way of making use of the increasing breadth of data sets available to the oceanographic and polar communities while at the same time improving the performance of models. However, the technique has yet to be fully exploited, especially in the context of polar oceans, and particularly in more rigorous forms that include less crude assumptions about model and observational errors. Pilot studies are required which propose to carry out an in-depth investigation and demonstration of data assimilation with the clear aim of improving models. There should be demonstrable benefit in terms of:

- providing new information about the polar environment which can be implemented in models (where that information cannot otherwise be easily or accurately derived from observations directly);
- providing new knowledge of errors in existing observations and/or models;
- providing a practical scheme that has potential for broad and effective use in polar research.

Total funds available for work selected under this portion of the announcement are approximately $12+M over three years. Money will be distributed across the research themes based on the quality of proposals received and in consideration of program balance. Proposals outside these themes may be considered, but must be highly competitive.

Programmatic priority will be given to those proposals making the strongest links to Earth Science Enterprise objectives through analysis of satellite data and by addressing oceanographic problems at basin or global scale.

Contacts are Dr. Eric Lindstrom (Physical Oceanography Program, 202-358-4540, elindstr@hq.nasa.gov), Dr. John Marra (Biological Oceanography Program, 202-358-0310, jmarra@hq.nasa.gov) and Dr. Kim Partington, (Polar Program, 202-358-0746, kparting@hq.nasa.gov). The fax for all three contacts is the same, at 202-358-2770.

4.0 GUIDANCE FOR PROPOSERS

This NRA solicits proposals for scientific investigations that are consistent with the objectives as detailed above, and that meet other requirements that are listed in the appendices. The proposal should provide sufficient detail to enable a reviewer to assess the value of the proposed research, and the probability that the investigators will be able to accomplish the stated objectives within the requested resources and schedule. Appendix A contains a detailed description of proposal contents and format specific to this NRA, and general guidelines for all NRAs are given in Appendix B.

Awards will be made for a period of up to three years to proposals that are approved under the terms of this announcement. Annual renewals of proposals under this NRA are contingent upon performance and availability of funds. NASA reserves the right to cancel this NRA if adequate funds are not appropriated.

4.1 Grant Requirements

Each selected proposal will be supported under a grant, contract, or interagency agreement between the PI's institution and NASA HQ or one of the three NASA Oceanography Centers. All grants must comply with

- Annual progress reports
- Yearly participation at Science Team meetings and activities
- Provision of publicity material to NASA as appropriate

Investigators proposing **fieldwork or any data measurements** will be required to identify:

- Field campaigns, cruises
- Methods
- Data management.

Regarding the last item, data obtained by support under this NRA must be ready for availability to the broad Earth science community within one year from collection and an appropriate plan and schedule must be provided in the proposal. For biological data, PIs in the program will also submit their data to the SeaWiFS Bio-Optical Archive and Storage System (SeaBASS). Submission procedures can be found at http://seabass.gsfc.nasa.gov/~seabass/seabass/html/seabass.html.

Investigators proposing **modeling or theoretical work** must clearly identify incremental tasks in accomplishing objectives.

Security. Proposals should not contain security-classified material. If the research requires access to, or may generate, security classified information, the submitter will be required to comply with U.S. Government security regulations.

4.2 Eligibility

Participation is open to all categories of domestic and foreign organizations, including educational institutions, industry, non-profit institutions, NASA centers, and other government agencies. In accordance with NASA policy as described in Appendix B, all investigations by foreign participants will be conducted on a no-exchange-of-funds basis, i.e., investigators whose home institution is outside the United States cannot be funded by NASA.

4.3 Letter of Intent

All prospective proposers are *strongly* encouraged to submit a letter of intent in response to this NRA. This will facilitate planning of the peer review process. The letter of intent should be submitted electronically to the URL: *http://www.earth.nasa.gov/LOI*. If the proposer does not have access to the Internet, a letter of intent should be faxed to 202-554-3024 with the following information:

- PI and Co-I names and addresses (including zip + 4)
- Title of proposal
- Telephone and fax numbers of PI
- Email address
- Brief summary of the proposed work (not to exceed 300 words)

4.4 Schedule

Letters of Intent should be submitted by **June 26, 2000**. Proposals may be submitted at any time during the period ending **July 26, 2000**. Proposals submitted to NASA will be evaluated using scientific peer review. Proposals selected for funding will be announced in **November, 2000**. Projected grant start date is **January 1, 2001.**

4.5 On-line References

For more information pertaining to this NASA Research Announcement see:

(1) NASA Research Opportunities http://www.earth.nasa.gov/nra/index.html
(2) NASA Oceanography Web site http://oceans.nasa.gov

5.0 INSTRUCTIONS FOR SUBMITTING PROPOSALS

Identifier **NRA-00-OES-05**

Submit Proposals to:
Oceanography NRA (NRA 00-OES-05)
NASA Peer Review Services, Code Y
500 E Street, Suite 200
Washington, DC 20024-2760

For overnight delivery purposes only, the recipient telephone number is 202-479-9030

Copies required: 10

Selecting Official:
Director, Research Division
Office of Earth Science
NASA Headquarters

Obtain Additional Information From:
Drs. Eric Lindstrom, John Marra, or Kim Partington
Code YS
NASA Headquarters
Washington, D.C. 20546-0001
Phone: 202-358-4540, -0310, -0746
Fax: 202-358-2770
Email: elindstr@hq.nasa.gov, jmarra@hq.nasa.gov, kparting@hq.nasa.gov

Please use identifier number NRA 00-OES-05 when making an inquiry regarding this Announcement. Proposals submitted to NASA Headquarters will cause a delay, therefore, please adhere to "Instructions for Submitting Proposals" noted above. Your interest and cooperation in participating in this opportunity are appreciated.

ORIGINAL SIGNED BY:

Dr. Ghassem R. Asrar
Associate Administrator
Office of Earth Science

APPENDIX A

ADDITIONAL INFORMATION AND GUIDANCE ON PROPOSAL FORMAT AND CONTENTS

Proposal Content and Format. The technical part of the proposal should be limited to the equivalent of 14 pages of text, single-spaced, with type no smaller than 12 pt. A reasonable number of figures and tables (generally, 5 pages or less) may be included , and do not count toward the text limit. The cover page, table of contents, abstract, management plan, data plan, description of facilities and equipment, cost plan, citations to the literature, and short resumes also do not count in the 14-page limit. Additional pertinent information (e.g., letters indicating the commitment of co-investigators and collaborators or international partners) may be added as appendices. The proposal should be self-contained, and should not refer reviewers to critical information on web-sites. If color is used, proposers should ensure that all copies should have color. Proposals should not be bound or in covers.

Cover Letter. Each proposal should be prefaced by a cover letter signed by an official of the investigator's institution who is authorized to legally bind the organization to the proposal and its content.

Proposal Cover Page. The proposal cover page should contain the following: a short, descriptive title for the proposed effort; the name of the proposing organization(s); names, addresses, telephone numbers, FAX numbers, electronic mail addresses, and affiliations of the Principal Investigator and all Co-Investigators; and a year by year budget summary, including a total for all years. An example cover page is provided in Appendix C.

Table of Contents (recommended length: 1 page). A table of contents listing the page numbers for key sections of the proposal, including the data, management, and cost plans should be provided.

Abstract (maximum of 1 page). The abstract should summarize the research proposed in one page or less. It should contain a simple, concise overview of the investigation, its objectives, its scientific approach, expected results, and the value of its results to the Oceanography and/or Sea-Ice Programs. It is very important that this abstract be specific and accurately represent the research to be conducted.

Project Description (maximum of 14 pages). The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the work plan, including the broad design of experiments to be undertaken

and a description of experimental methods and procedures. Deliverables should also be described.

Management Approach. For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities, and arrangements for ensuring a coordinated effort and timely data delivery should be described. Describe relationship among all individuals supporting the proposed effort, including leadership roles and points of contact.

Personnel. (2-3 pages per PI or Co-I). It is expected that the PI will be responsible for grant compliance and delivery. Short biographical sketches of the PI and all CoIs, containing a list of principal publications plus any exceptional qualifications should be included. Proposers should include previous work experience in the field of the proposal. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

Facilities and Equipment. Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non-research purposes should be explained.

Cost Plan for US Proposals Only. (recommended length: 1 page per budget year, 1 budget summary page, 1-2 pages of explanation/justification). A detailed cost plan must be provided for each year of the proposed effort. Costs should be broken down into all of the following categories that apply: salaries and wages (including staff-months and rates for all personnel), benefits, supplies, services, equipment purchases, data purchases, computer services, publication costs, communication, travel, miscellaneous/other and overhead. Any unusual requests for funds (e.g., computer, and expensive equipment) must be specifically justified. Contribution from any cost-sharing plan or other support for the proposed research should be detailed. PIs should budget for one major oceanography conference per year, and if proposing to be a member of a science team (e.g., the SeaWiFS Science Team), they should budget for one science team meeting per year. If proposers wish to access the GSFC Supercomputer, they should not list costs, but indicate the number of computing units (CUs) they plan to use per year. The cost plan should include provision for buying data, if necessary Recently, NASA has initiated a "Science Data Buy Program" as a part of its Commercial Remote Sensing Program

(CRSP) at NASA's Stennis Space Center. Excellent land remote sensing data sets can be available from five companies simply by confirming a requestor's requirements through an online proposal request, which is subsequently validated by NASA Headquarters Program Managers. Information on obtaining this data can be found at http://www.crsp.ssc.nasa.gov/databuy. Proposers should contact CRSP for data availability prior to including this resource in proposals. Any data purchase costs (where applicable) should be described in the research plan, an included in the research budgets.

Current and Pending Support. For other current projects being conducted by the principal investigator or proposed for funding, provide title of project, sponsoring agency, ending date, and amount of support received or requested.

APPENDIX B

INSTRUCTIONS FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS

NASA Federal Acquisition Regulation (FAR), Supplement (NFS) Part 1852.235-72, Effective JANUARY 2000

(a) **General.**

(1) Proposals received in response to a NASA Research Announcement (NRA) will be used only for evaluation purposes. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a pre-award synopsis published for individual proposals.

(2) A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that NASA and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

(3) NRAs contain programmatic information and certain requirements which apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information which applies to responses to all NRAs.

(4) A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. NASA will determine the appropriate instrument. Contracts resulting from NRAs are subject to the Federal Acquisition Regulation and the NASA FAR Supplement. Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPG 5800.1).

(5) NASA does not have mandatory forms or formats for responses to NRAs; however, it is requested that proposals conform to the guidelines in these instructions. NASA may accept proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposers' most favorable terms.

(6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost

information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation.

(b) **NRA-Specific Items.**

Several proposal submission items appear in the NRA itself: the unique NRA identifier; when to submit proposals; where to send proposals; number of copies required; and sources for more information. Items included in these instructions may be supplemented by the NRA.

(c) The following information is needed to permit consideration in an objective manner. NRAs will generally specify topics for which additional information or greater detail is desirable. Each proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.

(1) **Transmittal Letter or Prefatory Material.**

(i) The legal name and address of the organization and specific division or campus identification if part of a larger organization;
(ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;
(iii) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;
(iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;
(v) Identification of other organizations that are currently evaluating a proposal for the same efforts;
(vi) Identification of the NRA, by number and title, to which the proposal is responding;
(vii) Dollar amount requested, desired starting date, and duration of project;
(viii) Date of submission; and
(ix) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization (unless the signature appears on the proposal itself).

(2) **Restriction on Use and Disclosure of Proposal Information.** Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following notice on the title page of the proposal and specify the information subject to the notice by inserting an appropriate identification in the notice. In any event, information contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

Notice
Restriction on Use and Disclosure of Proposal Information

The information (data) contained in *[insert page numbers or other identification]* of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal the Government shall have the right to use and disclose this information (data) to the extent provided in the contract (or other agreement). This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

(3) **Abstract.** Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective and the method of approach.

(4) **Project Description.**

(i) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation factors in these instructions and any specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.

(ii) When it is expected that the effort will require more than one year, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.

(5) **Management Approach.** For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and - arrangements for ensuring a coordinated effort should be described.

(6) **Personnel.** The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel

who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

(7) **Facilities and Equipment.**

(i) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.

(ii) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non-research purposes should be explained.

(8) **Proposed Costs (U.S. Proposals Only).**

(i) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for salaries and wages; fringe benefits; equipment; expendable materials and supplies; services; domestic and foreign travel; ADP expenses; publication or page charges; consultants; subcontracts; other miscellaneous identifiable direct costs; and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all staffing data in terms of staff-months or fractions of full-time.

(ii) Explanatory notes should accompany the cost proposal to provide identification and estimated cost of major capital equipment items to be acquired; purpose and estimated number and lengths of trips planned; basis for indirect cost computation (including date of most recent negotiation and cognizant agency); and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases.

(iii) Allowable costs are governed by FAR Part 31 and the NASA FAR Supplement Part 1831 (and OMB Circulars A-21 for educational institutions and A-122 for nonprofit organizations).

(iv) Use of NASA funds--NASA funding may not be used for foreign research efforts at any level, whether as a collaborator or a subcontract. The direct purchase of supplies and/or services, which do not constitute research, from non-U.S. sources by

U.S. award recipients is permitted. Additionally, in accordance with the National Space Transportation Policy, use of a non-U.S. manufactured launch vehicle is permitted only on a no-exchange-of-funds basis.

(9) **Security.** Proposals should not contain security classified material. If the research requires access to or may generate security classified information, the submitter will be required to comply with Government security regulations.

(10) **Current Support.** For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

(11) **Special Matters.**

(i) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.

(ii) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

(d) **Renewal Proposals.**

(1) Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. A renewal proposal should not repeat all of the information that was in the original proposal. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which support is desired. A description of any significant findings since the most recent progress report should be included. The renewal proposal should treat, in reasonable detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.

(2) NASA may renew an effort either through amendment of an existing contract or by a new award.

(e) **Length.** Unless otherwise specified in the NRA, effort should be made to keep proposals as brief as possible, concentrating on substantive material. Few proposals need exceed 15-20 pages. Necessary detailed information, such as reprints, should be included as attachments. A complete set of attachments is necessary for each copy of the proposal. As proposals are not returned, avoid use of "one-of-a-kind" attachments.

(f) **Joint Proposals.**

(1) Where multiple organizations are involved, the proposal may be submitted by only one of them. It should clearly describe the role to be played by the other organizations

and indicate the legal and managerial arrangements contemplated. In other instances, simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.

(2) Where a project of a cooperative nature with NASA is contemplated, describe the contributions expected from any participating NASA investigator and agency facilities or equipment which may be required. The proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals which specify the internal arrangements NASA will actually make are not acceptable as a means of establishing an agency commitment.

(g) **Late Proposals.** Proposals or proposal modifications received after the latest date specified for receipt may be considered if a significant reduction in cost to the Government is probable or if there are significant technical advantages, as compared with proposals previously received.

(h) **Withdrawal.** Proposals may be withdrawn by the proposer at any time before award. Offerors are requested to notify NASA if the proposal is funded by another organization or of other changed circumstances which dictate termination of evaluation.

(i) **Evaluation Factors.**

(1) Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.

(2) Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.

(3) Evaluation of its intrinsic merit includes the consideration of the following factors of equal importance:

(i) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.

(ii) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these which are integral factors for achieving the proposal objectives.

(iii) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.

(iv) Overall standing among similar proposals and/or evaluation against the state-of-the-art.

(4) Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds.

(j) **Evaluation Techniques.** Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal which is scientifically and programmatically meritorious, but not selected for award during its initial review, may be included in subsequent reviews unless the proposer requests otherwise.

(k) **Selection for Award.**

(1) When a proposal is not selected for award, the proposer will be notified. NASA will explain generally why the proposal was not selected. Proposers desiring additional information may contact the selecting official who will arrange a debriefing.

(2) When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation. The contracting officer may request certain business data and may forward a model award instrument and other information pertinent to negotiation.

(l) **Additional Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.**

(1) NASA welcomes proposals from outside the U.S. However, foreign entities are generally not eligible for funding from NASA. Therefore, unless otherwise noted in the NRA, proposals from foreign entities should not include a cost plan unless the proposal involves collaboration with a U.S. institution, in which case a cost plan for only the participation of the U.S. entity must be included. Proposals from foreign entities and proposals from U.S. entities that include foreign participation must be endorsed by the respective government agency or funding/sponsoring institution in the country from which the foreign entity is proposing. Such endorsement should indicate that the proposal merits careful consideration by NASA, and if the proposal is selected, sufficient funds will be made available to undertake the activity as proposed.

(2) All foreign proposals must be typewritten in English and comply with all other submission requirements stated in the NRA. All foreign proposals will undergo the same evaluation and selection process as those originating in the U.S. All proposals must be received before the established closing date. Those received after the closing date will be treated in accordance with paragraph (g) of this provision. Sponsoring foreign government agencies or funding institutions may, in exceptional situations, forward a proposal without endorsement if endorsement is not possible before the announced closing date. In such cases, the NASA sponsoring office should be advised when a decision on endorsement can be expected.

(3) Successful and unsuccessful foreign entities will be contacted directly by the NASA sponsoring office. Copies of these letters will be sent to the foreign sponsor. Should a foreign proposal or a U.S. proposal with foreign participation be selected, NASA's Office of External Relations will arrange with the foreign sponsor for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency or funding institution will each bear the cost of discharging their respective responsibilities.

(4) Depending on the nature and extent of the proposed cooperation, these arrangements may entail:

(i) An exchange of letters between NASA and the foreign sponsor; or
(ii) A formal Agency-to-Agency Memorandum of Understanding (MOU).

(m) **Cancellation of NRA.** NASA reserves the right to make no awards under this NRA and to cancel this NRA. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation.

Appendix C

Proposal Cover Sheet

NASA Research Announcement 00-OES-05
Proposal No. _____ (Leave Blank for NASA Use)

Title: _____

Principal Investigator:_____

Department:_____

Institution: _____

Street/PO Box: _____

City: _____ State: _____ Zip: _____

Country: _____ Congressional District:_____
(used for database sorting purposes only)

E-mail: _____

Telephone: _____ Fax: _____

Co-Investigators:

Name	Institution & Email Address	Address & Telephone
_____	_____	_____
_____	_____	_____
_____	_____	_____

Budget:
1st Year: _____ 2nd Year: _____ 3rd Year: _____ Total: _____

Certification of Compliance with Applicable Executive Orders and U.S. Code

By submitting the proposal identified in this *Cover Sheet/Proposal Summary* in response to this Research Announcement, the Authorizing Official of the proposing institution (or the individual proposer if there is no proposing institution) as identified below:

- certifies that the statements made in this proposal are true and complete to the best of his/her knowledge;
- agrees to accept the obligations to comply with NASA award terms and conditions if an award is made as a result of this proposal; and
- confirms compliance with all provisions, rules, and stipulations set forth in the two Certifications contained in this NRA [namely, (i*) Certification of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs*, *and (ii) Certifications, Disclosures, And Assurances Regarding Lobbying and Debarment & Suspension*].

Willful provision of false information in this proposal and/or its supporting documents, or in reports required under an ensuing award, is a criminal offense (U.S. Code, Title 18, Section 1001).

Title of Authorizing Institutional Official: _____

Signature: _____ Date: _____

Name of Proposing Institution: _____

Telephone: _____ E-mail: _____ Facsimile: _____

Certification of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs

The *(Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant ")* hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1962 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

this assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognized and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign on behalf of the Applicant.

NASA FORM 1206

CERTIFICATIONS, DISCLOSURES, AND ASSURANCES REGARDING LOBBYING AND DEBARMENT & SUSPENSION

1. LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 14 CFR Part 1271, as defined at 14 CFR Subparts 1271.110 and 1260.117, with each submission that initiates agency consideration of such applicant for award of a Federal contract, grant, or cooperative agreement exceeding $ 100,000, the applicant must **certify** that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit a Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

2. GOVERNMENTWIDE DEBARMENT AND SUSPENSION

As required by Executive Order 12549, and implemented at 14 CFR 1260.510, for prospective participants in primary covered transactions, as defined at 14 CFR Subparts 1265.510 and 1260.117—

(1) The prospective primary participant **certifies** to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency.

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (l)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Certification of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs

The *(Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant ")* hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1962 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

this assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognized and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign on behalf of the Applicant.

NASA FORM 1206

CERTIFICATIONS, DISCLOSURES, AND ASSURANCES REGARDING LOBBYING AND DEBARMENT & SUSPENSION

1. LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 14 CFR Part 1271, as defined at 14 CFR Subparts 1271.110 and 1260.117, with each submission that initiates agency consideration of such applicant for award of a Federal contract, grant, or cooperative agreement exceeding $ 100,000, the applicant must **certify** that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit a Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

1. GOVERNMENTWIDE DEBARMENT AND SUSPENSION

As required by Executive Order 12549, and implemented at 14 CFR 1260.510, for prospective participants in primary covered transactions, as defined at 14 CFR Subparts 1265.510 and 1260.117—

(1) The prospective primary participant **certifies** to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency.

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (l)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

APPENDIX D

BUDGET SUMMARY

For period from _____ to _____

• Provide a complete Budget Summary for year one and separate estimates for each subsequent year.
• Enter the proposed estimated costs in Column A (Columns B & C for NASA use only).
• Provide as attachments detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost. See *Instructions For Budget Summary* on following page for details.

		NASA USE ONLY	
	A	**B**	**C**
1. Direct Labor (salaries, wages, and fringe benefits)			
2. Other Direct Costs:			
a. Subcontracts			
b. Consultants			
c. Equipment			
d. Supplies			
e. Travel			
f. Other			
3. Facilities and Administrative Costs			
4. Other Applicable Costs:			
5. SUBTOTAL--Estimated Costs			
6. Less Proposed Cost Sharing (if any)			
7. Carryover Funds (if any)			
a. Anticipated amount : _____			
b. Amount used to reduce budget			
8. Total Estimated Costs			
9. APPROVED BUDGET			

APPENDIX E

INSTRUCTIONS FOR BUDGET SUMMARY

1. Direct Labor (salaries, wages, and fringe benefits): Attachments should list the number and titles of personnel, amounts of time to be devoted to the grant, and rates of pay.

2. Other Direct Costs:
    a. Subcontracts: Attachments should describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting.
    b. Consultants: Identify consultants to be used, why they are necessary, the time they will spend on the project, and rates of pay (not to exceed the equivalent of the daily rate for Level IV of the Executive Schedule, exclusive of expenses and indirect costs).
    c. Equipment: List separately. Explain the need for items costing more than $5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Grant Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the basic research proposed and why it cannot be purchased with indirect funds.
    d. Supplies: Provide general categories of needed supplies, the method of acquisition, and the estimated cost.
    e. Travel: Describe the purpose of the proposed travel in relation to the grant and provide the basis of estimate, including information on destination and number of travelers where known.
    f. Other: Enter the total of direct costs not covered by 2a through 2e. Attach an itemized list explaining the need for each item and the basis for the estimate.

3. Facilities and Administrative (F&A) Costs: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.

4. Other Applicable Costs: Enter total explaining the need for each item.

5. Subtotal-Estimated Costs: Enter the sum of items 1 through 4.

6. Less Proposed Cost Sharing (if any): Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.

7. Carryover Funds (if any): Enter the dollar amount of any funds expected to be available for carryover from the prior budget period Identify how the funds will be used if they are not used to reduce the budget. NASA officials will decide whether to use all or part of the anticipated carryover to reduce the budget (not applicable to 2nd-year and subsequent-year budgets submitted for award of a multiple year award).

8. Total Estimated Costs: Enter the total after subtracting items 6 and 7b from item 5.

APPENDIX F

BIBLIOGRAPHY

NASA. 2000. Science Implementation Plan.